

nel cloud. In these cases, destructive winds, hail, rain, and lightning occur, roofs are blown off, trees are prostrated, and the newspapers record a tornado, whereas to the meteorologist it is strictly speaking only a violent gust of wind, a heavy thunderstorm, a cloudburst, a hailstorm, a straight-line wind, or derecho. There are many terms applicable to these local storms, but it is certainly not proper to call them tornadoes unless the funnel-shaped cloud is actually observed. A destructive wind is not necessarily a tornado.

In the very severe storm that passed eastward, a little north of Washington, D. C., on Wednesday, August 2, 1899, the Editor studied the movements of the atmosphere until driven to shelter by the heavy rain. There was a continuous rumble of thunder from the northern sky, not an occasional clap with its echoes, but a steady angry roar that came apparently from the center of a great disturbance 5 or 10 miles distant in the north and northeast. The cirrus and alto-cumulus overflow from this stormy region extended southward over the observer, but left a portion of the western and southern sky unobscured. The lower cumuli flowed rapidly from the south and southwest toward the storm center. Below these clouds were the lowest scud formed at the upper surface of the layer of cold air that flows out from the region of falling rain and hail; these were seen in the distant north and north-northwest from 1 to 3 miles away. One could see that the severity of the storm was passing far north of the observer. But suddenly an intermediate fracto-cumulus scud was to be seen moving more rapidly and in larger volume from the rainy region in the north. In the progress of these scuds southward they could be distinctly seen to mingle with the southwest current and then return with it so as to describe from a third to a complete circle before they disappeared. Similar distinct whirls among the clouds have been seen, when our thunderstorms are northwest of Washington, forming clouds such as are represented by the concentric bands, shown on Plates XI and XII of the MONTHLY WEATHER REVIEW for May, 1898. Such whirls as this on the outskirts of a region of rain and hail do not owe their origin and maintenance to the updrift of buoyant moist ascending cloudy air. This latter is the mechanical cause of the great whirl disturbance fed by southerly winds rising up over dense cold air or over rising land and condensing in big black clouds.

RAIN GAGES AT HIGH STATIONS.

In continuation of the remarks on page 257 of the MONTHLY WEATHER REVIEW for June, Mr. F. H. Newell, Chief Hydrographer of the United States Geological Survey, desires to say that if at any time there is a chance to secure rainfall observers at high altitudes, he will be glad to cooperate by furnishing the gages.

SPURIOUS TORNADO PHOTOGRAPHS.

The article on this important subject on pages 203-4 of the MONTHLY WEATHER REVIEW for May, 1899, has elicited several interesting comments. The Editor was himself to blame for inserting a paragraph that has caused the only unfavorable comment that we have heard of.

In reference to Mr. P. Connor, of Kansas City, Mo., and Mr. F. Z. Gosewisch, whose names are mentioned in the article, it should be distinctly stated that they simply forwarded these interesting photographs to the Weather Bureau, and, therefore, were not the photographic artists elsewhere referred to in the article.

One correspondent suggests that the Weather Bureau officials may be unnecessarily critical with reference to the tornado photographs. It appears that most persons are satisfied

to look upon the funnel-shaped cloud as the tornado photograph, but this is not meteorology. We wish to obtain for meteorological study prints from the original negatives showing both the ground below and the clouds above in their actual connection with the funnel cloud at any given moment. We do not wish to have the photographer alter the appearance of the funnel by especially intense printing, or by substituting another foreground or touching up the surrounding clouds. Every change made by him for the purpose of beautifying or of intensifying some special feature is likely to injure the photograph for our purposes, although it may render the picture more acceptable to the general public.

We have a few genuine photographs of tornado clouds; that is to say, neither by retouching nor by special printing processes have the meteorological features been appreciably altered. We shall be glad to learn of others that are equally reliable, as it will be a serious disappointment if the measurements and calculations that are being made with reference to tornadoes turn out to be based upon unreliable photographic prints.

GENERAL FORECASTS FOR WASHINGTON, OREGON, AND IDAHO.

On the daily weather map issued at Portland, Oreg., on July 11, Mr. Pague publishes the following:

Weather synopsis and general forecast for Washington, Oregon, and Idaho.

The map this morning presents the first pure type of summer weather conditions for the year 1899. Summer and winter weather types first appeared in former years as follows:

Summer.		Winter.	
1895.....	April 20	1895.....	November 12
1896.....	June 18	1896.....	October 20
1897.....	April 11	1897.....	October 19
1898.....	July 7	1898.....	October 19
1899.....	July 11		

The morning map of June 12 showed an almost pure summer high. The conditions that morning lacked a few distinct characteristics, which are fully shown this morning. Summer weather really began June 12, though to-day marks the pure type. From June 12 to date there has been a succession of highs moving from the ocean on the west or southwest, becoming central along the Washington coast, but not moving, as a whole, eastward over Washington; it was only the absence of this movement that prevented the highs being classed as "summer highs." The high shown over northwestern Washington this morning was off Cape Mendocino the morning of the 7th; its movement northward has been sluggish, but it is now moving eastward on about the forty-ninth degree, north latitude, the path of the summer highs. For months temperatures below the normal have prevailed, the sunshine has been deficient in amount, and up to June 5 rains were frequent. The change to seasonable weather conditions has now taken place, and regular periods of warm and cool weather will prevail. The presence of summer weather conditions makes possible the occurrence of hot northeast winds east of the Cascades, and while such are not probable within the next several days, they may occur with the movement of the next high, which will be about Monday or Tuesday next. Sprinkles of rain from the highs west of the Cascades and showers from thunderstorms east of them are probable at intervals, and rains from these causes are all that will occur until the appearance of winter weather conditions in September or October. Summer conditions are well marked by several days of cool weather with high fog, followed by several days of cloudless weather and higher temperatures, lasting about three days, then a recurrence to cooler. Under the recurrent conditions sprinkles of rain may occur.

THE PRESENT STATUS OF METEOROLOGY.

The Quarterly Journal of the Royal Meteorological Society for April, 1899, was received during the month of July and contains two articles that will greatly interest American readers.

The last few pages of the Journal are occupied by an address delivered last February by Prof. Wm. M. Davis "On the Circulation of the Atmosphere." In this article Professor Davis endeavors to correct some errors that are sadly prevalent both in Great Britain and her colonies. Explanations that were accepted many years ago are still repeated in spite of the great advance that has taken place during the past thirty years in the views of those who are recognized as the leaders of modern theoretical meteorology. Professor Davis' address reminds us of the following remarks lately made by the Editor:

There are those who adhere to the opinion that the observer and statistician is the one best calculated to determine the causes and the processes that lie behind his observed phenomena. There are others who think that the pure mathematician and mechanician can best deal with these problems of cause and effect. A third class holds that the experimental physicist is the highest authority. Thus it happens that meteorology has during the past century been taught by three classes of authorities, each of whom found it difficult to perceive the force of the arguments of the otherside. At the present moment, England, France, Germany, and America, respectively, still have distinguished members of each of these schools busily disseminating different views of the same subject. Fortunately, however, the leading tendency is everywhere toward a proper combination of observation, experiment, and theory; and we are rapidly nearing the day when the good work done in the mechanics of the atmosphere by Ferrel, Helmholtz, Oberbeck, von Bezold, Bjerknes, Margules, James Thomson, and other mathematical writers will be fully understood and appreciated by every real student, and when the experimental work of a host of prominent physicists will also be assimilated by all. Among recent works it is those of William Ferrel that most prominently stand out as cosmopolitan. Meteorological statistics, experimental data, and mathematical mechanics were drawn upon by him at every point in his efforts to elucidate atmospheric phenomena. His work still stands at the head of all, and if in any point it is to be amended in the future, it will only be when newer observations and higher mathematical powers become available for the attack on the difficult problems of meteorology.

To the ordinary reader the report on "Government Meteorological Organizations in Various Parts of the World," an address delivered on January 18 by F. Campbell Bayard, L. L. M., President of the Royal Meteorological Society, will be esteemed as the most satisfactory, most complete and authoritative statement yet published of the condition of official meteorology throughout the world. The address proper occupies eighteen pages and the appendix, giving original details, fills thirty-five pages additional. Thirty-five different organizations are enumerated as maintained by a corresponding number of countries or colonies. Of course it is impossible here to summarize the innumerable details. Perhaps the importance of meteorological work at the present time is best expressed by the table given by President Bayard, showing the amount of money granted specifically for meteorology. In most of these cases the sums appear small as compared with that expended by the United States, but they would generally be largely increased if other countries paid in cash for telegraphy, and employed the whole time of many men in distributing maps and forecasts, answering telegrams and telephones, and otherwise devoting themselves wholly to meteorological work. The annual appropriation by the United States averages about 32 cents per square mile of territory, or $1\frac{1}{2}$ cents per inhabitant. In the other countries the rates vary considerably, but in no case

are they at all comparable with the vast interests that are protected and benefited.

The Royal Society has earned a debt of gratitude by collecting and publishing these sixty pages of meteorological information.

THE DIURNAL VARIATION OF THE BAROMETER.

This subject is one that has been treated most exhaustively from an observational point of view by Hann who has, in numerous papers, summed up the results of his own and other investigations. In general he concludes that the twenty-four hour or daily component of the regular barometric oscillation must be due to the direct action of the sun's heat, but that the twelve hour, or semi-diurnal term which exhibits the greatest uniformity over the whole globe must be due to some cosmic influence, whose nature has not yet been suggested or suspected.

In the presence of Hann's exhaustive monographs and this check upon his efforts to arrive inductively at some reasonable explanation of the origin of these variations, it now seems necessary to stop for a while in this course of study and investigate the subject deductively. We must follow out to their logical conclusions all the laws of mechanics and physics that we know to be at work in the atmosphere. The Editor has collected many of these and is safe in stating that there are many diurnal movements and changes going on in the atmosphere that can produce second or third terms in the harmonic development, but it is not always easy to foresee what their relative importance may be. Hann, as a meteorologist, has now brought the problem up to a stage in the inquiry where the ablest mathematical students must take hold of it, and they will, doubtless, find it worthy of their genius. We doubt not that the source of the semi-diurnal terms will be found within the atmosphere itself.

RIVER DISCHARGES IN COLORADO.

The total quantity of water discharged per second by various rivers in Colorado, together with the height of the river at the gage, is published by Mr. F. H. Brandenburg in the July report of the Colorado Section. The measurements are made by the Hydrographic Division of the United States Geological Survey. The majority of the streams maintained an unusually high average during July. The discharge of the Arkansas was 46 per cent, and that of the South Platte, 38 per cent above the normal. The discharge of the Rio Grande was 146 per cent above normal, or nearly $2\frac{1}{2}$ times the normal. The importance of rain-gage stations at high points in the mountains, so as to represent the whole watershed of the rivers has already been mentioned in the MONTHLY WEATHER REVIEW by Messrs. Newell and Pressley of the United States Geological Survey.

BACK NUMBERS OF THE MONTHLY WEATHER REVIEW.

Prof. H. A. Rowland, Johns Hopkins University, desires to obtain the numbers of the MONTHLY WEATHER REVIEW for the year 1882 to complete his set.

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Chief of Division of Records and Meteorological Data.

PRESSURE.

The pressure distribution for the month is graphically shown on Chart IV. As in the preceding month, the pressure was relatively high on both coasts, being lowest in the Plateau region and at the mouth of the St. Lawrence. The

great high areas of both the Atlantic and Pacific, especially the latter, seem to have maintained their winter positions longer than usual. Pressure in the interior of the continent was also higher than usual. As compared with the preceding month pressure fell in the lower Lake region and generally